

ANSWERS TO EXAMPLE - 4

HYPOTHETICAL – NEW ELECTRICAL GENERATING UNIT ASSUME 3 GENERATING UNITS (49.6 MW/UNIT)

TOOLS:

Emissions Factors (EF) BACT Emission Limits:

| Pollutant | Emissions Factor (lb/hr per unit)* |
|---|------------------------------------|
| PM | 7.3 |
| SO ₂ | 0.83 |
| NO _x | 11.07 |
| VOC | 2.47 |
| CO | 10.78 |
| Emission Factors - Greenhouse Gases from AP-42, Table 3.1-1 (Stationary Gas Turbines) | |
| CO ₂ | 110 lb/MMBtu* |
| CH ₄ | 8.6 E-03 lb/MMBtu* |
| N ₂ O | 0.003 lb/MMBtu* |

* 1 MW = 3.41 MMBtu

PROBLEM SOLVING:

Question 1: What would the emissions be for the proposed project?

Example Calculations:

PM₁₀ Emissions [tons/yr] =

(3 Units) * (7.30 lb/hr) * (8760 hr/yr) * 1 ton/2000 lb = **95.92 tons/yr**

CH₄ Emissions [tons/yr]=

(3 units)*(49.6 MW)*(3.41 MMBtu/MW)*(0.0086 lb/MMBtu)*(8760 hrs/yr)*1 ton/2000lb = **19.11 tons/yr**

Calculations:

| Calculated Total Emissions (Tons/Year): | | | | | | | | |
|---|-----------------|-----------------|-------|--------|----------------------|-----------------|------------------|--|
| Criteria Pollutants Emissions | | | | | GHG Emissions (mass) | | | |
| PM ₁₀ | SO ₂ | NO _x | VOC | CO | CO ₂ | CH ₄ | N ₂ O | |
| 95.92 | 10.91 | 145.43 | 32.46 | 141.65 | 261,360 | 19.11 | 6.67 | |

Question 2: On a mass basis, what are the total emissions of GHGs?

$\text{CO}_2 + \text{CH}_4 + \text{N}_2\text{O} = \text{Total Emissions of GHG's (on a mass basis, TPY)}$

= 261,386 TPY (mass)

Question 3: What are the total emissions of CO_{2e}?

Step 1: Refer to Global Warming Potential (GWP) Table (Title 40, Part 98, Subpart A, Table A-1)

Step 2: Identify pollutants and their respective GWPs.

| Pollutant | Global Warming Potential |
|------------------|--------------------------|
| CO ₂ | 1 |
| CH ₄ | 21 |
| N ₂ O | 310 |

$$\text{CO}_{2e}(\text{tpy}) = \sum_i (\text{GWP}_i \times \text{MassEmissionRate}_i(\text{tpy}))$$

CO_{2e}(tpy) Example = (mass CO₂*1) + (mass CH₄ *21) + (mass N₂O *310) =

= 263,828 TPY CO_{2e}

Calculations [TPY] =

| GHG (mass) (TPY) | CO _{2e} (TPY) |
|------------------|------------------------|
| 261,386 TPY | 263,828 TPY |

APPLICABILITY ANALYSIS:

Question 1: Does this facility require a Title V permit anyway? (e.g. major source, regulated pollutants ≥ 100 tpy)? (ARM 17.8.1204 and 17.8.1201(23)) **YES** Facility is a major source which emits ≥ 100 TPY any air pollutant (Non-GHG)

Question 2: Does the permit action have GHG emissions in excess of thresholds?

- a. **YES** Facility emissions ≥ 0 TPY GHG mass
- b. **YES** Facility emissions $\geq 100/250$ TPY GHG mass
- c. **YES** Facility emissions $\geq 75,000$ TPY CO_{2e}
- d. **YES** Facility emissions $\geq 100,000$ TPY CO_{2e}

Question 3: Does the permit action require a PSD analysis?

| | | |
|---|-----------|-------------|
| >100 tpy listed major source (ARM 17.8.801) | Yes _____ | No _____ |
| >250 tpy non-listed major source | Yes _____ | No X |

WHAT ARE THE NEW FACILITY'S PERMIT REQUIREMENTS?

If the Permit Decision occurs before 1/2/2011: GHG's do not need to be considered

Step 1: If the permit decision occurs between 1/2/2011 and 7/1/2011:

PSD

Does the facility trigger a PSD action "anyway"? The Facility would be considered a non-listed source and the emissions of regulated pollutants are less than 250 TPY, so this facility does not trigger a PSD action.

Title V

The facility requires a Title V Operating Permit, "anyway". GHG's must be addressed in the Title V permit. The Title V Operating permit would include applicable requirements for GHGs if there were any. (Note: At this time there are no applicable requirements for GHGs, so the facility would simply need to acknowledge GHGs. The Department would address GHGs in the Technical Review Document attached to the Operating permit).

The new facility must submit an application for the Title V Operating Permit by 7/1/2011 or one year after commencing operation—whichever is later (ARM 17.8.1205).

Step 2: If the permit decision occurs after 7/1/2011:

PSD

The facility does not trigger a PSD action for criteria pollutants because they are all less than 250 tpy. However, the GHG emissions exceed 250 tpy and the CO₂e emissions exceed the PSD threshold of 100,000 tpy. Therefore, the facility would be subject to PSD for GHGs and any other applicable regulated pollutants. For PSD, the facility must complete a BACT analysis for GHGs. EPA hopes to have some guidance on GHG-BACT Analysis soon.

Title V

The facility requires a Title V Permit anyway, and applicable requirements for GHGs would be included if there were any. (Note: At this time there are no applicable requirements for GHGs, so the facility would simply need to acknowledge GHGs. The Department would address GHGs in the Technical Review Document attached to the Operating permit).

The new facility must submit an application for the Title V Operating Permit by 7/1/2011 or one year after commencing operation—whichever is later (ARM 17.8.1205).